THE AFRICAN JOURNAL OF

Tropical Hydrobiology and Fisheries

(Afr. J. Trop. Hydrobiol. Fish.)

EDITOR J. Okedi
SUB-EDITOR: S. Wanambwa (Mrs.)

EDITORIAL BOARD

L. Obeng
N. Odero
S. N. Semakula
M. Hyder
W. B. Banage
A. M. A. Imevbore
W. A. Sichone
V. O. Sagua
R. E. Morris
A. F. De Bont
G. E. B. Kitaka

East African Literature Bureau
NAIROBI DAR ES SALAAM KAMPALA

provided by Aquatic Comm
brought to you by CO
nd similar papers at core.ac.uk

AN ANALYSIS OF THE 1970 COMMERCIAL FISH CATCH IN THREE AREAS OF THE KAFUE FLOODPLAIN

G. V. EVERETT
Department of Wildlife, Fisheries, and National Parks
P.O. Box 1, Chilanga, Zambia.

ABSTRACT
The commercial landings of fish in three areas of the Kafue Floodplain were examined in regard to fishing technique used, cateh per unit effort, and species composition and length size. Gillnets were used throughout the year although predominantly in the wet scason, and drawnets (similar to beach seines) were used at periods of low water level. Fishermen used a varying number of gillnets in each area, and the catehes also varied according to month. Principal species caught on the floodplain were *Clarias gariepinus* and *Tilapia andersoni*. There are indications that, whereas the catch per gillnet in the years 1965-1970 may be lower than in the 1950s, the drawnet cateh per unit of effort of these later years is higher than in the 1950s.

Present address:
Hunting Technical Services, Borehamwood, Hertfordshire, England.

INTRODUCTION

The objects of this study were to examine, compare, and analyse the monthly catch, effort, size and abundance of fish species, as caught by fishermen in three representative areas of the Kafue floodplain fishery. The study areas were Maala, in the upstream sector of the floodplain from Itezhitezi to Chikwato, Lochinvar in the central sector of Chikwatoto Shakapinga, and Chanyanya with Kafue in the downstream sector of Chifulamino to Kafue Gorge (Fig. 1). The study took place in the last four months of 1969, throughout 1970, and in the first four months of 1971.

LAGLER, KAPETSKY and STEWART (1972) have already reported on the probable effect of the Kafue Gorge Dam on the floodplain fisheries. CHAPMAN, MILLER, DUDLEY and SCULLY (1971) have likewise reported on the ecology of fishes in the Kafue River.

The floodplain fishery is dominated by the varying level of water and its effect on fishermen and consequent fishing effort. Flooding occurs during and after the rainy season of November through March. The 1968-69 rainfall was higher than most previous years and water level on the floodplain remained high throughout 1969. Rainfall in 1968-70 was less high and hence water level was low in the 1970 dry period.

Fresh fish traders reach Maala throughout the year. Busangu fish camp—about 6 km

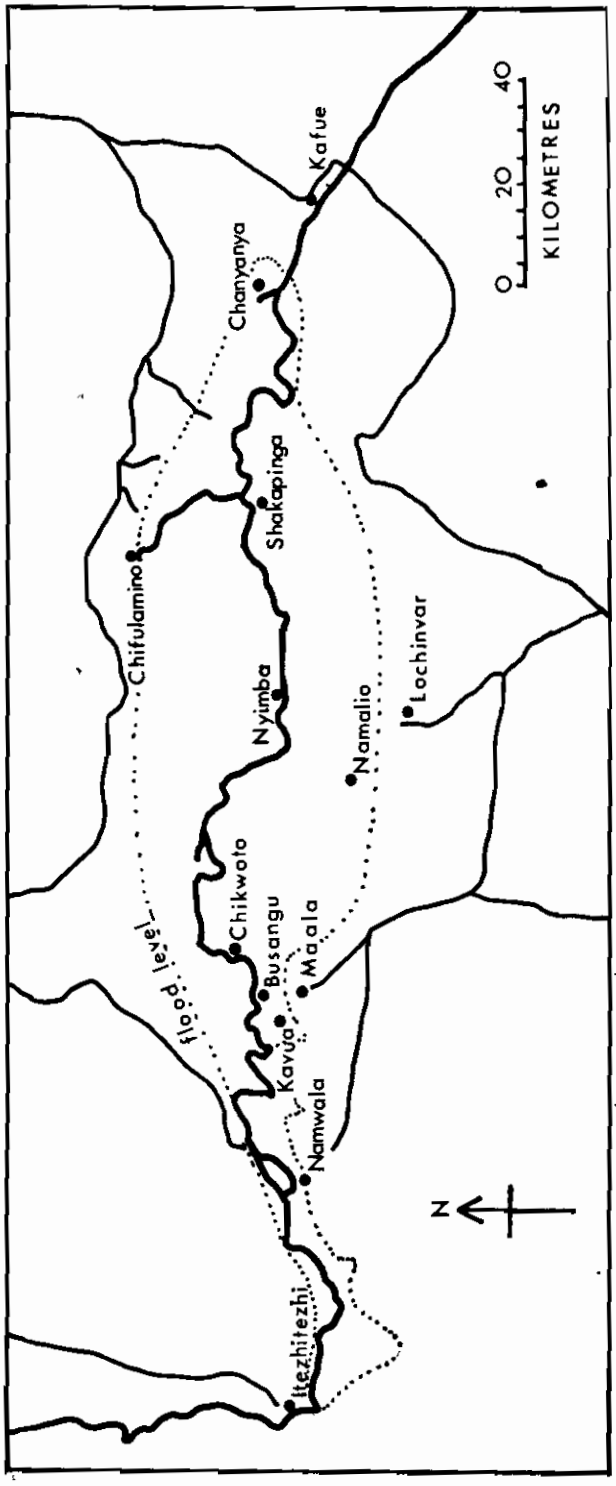

Figure 1. The Kafue floodplain

from Maala—was visited every month except January and February 1970, when traders bought fish at the nearby camp of Kavua. Data from the central sector of the floodplain were collected at Namalio and Nyimba fish camps (Lochinvar area). The majority of fish caught in the area was dried before sale. Nyimba is on the river bank and Namalio is at the edge of the floodplain. Both camps are islands in the flooded period of, usually, December through July although Nyimba is an island for about two months more in the year than Namalio. The fishermen at Namalio catch most fish when the waters have started to recede and fishermen at Nyimba catch most fish in the period of low waters. Chanyanya is flooded in the flood season, and catches were then recorded at Kafue to where many fishermen had moved. The market demand is high in this area, and traders on bicycles frequently bought fish for sale in Lusaka.

A minimum of two days per month was spent in each area. Records were taken of weight of fish landed, number of nets and frequency of landings by fishermen, and the type and length of species landed. At Maala the landings were not the same as total catch, because *Clarias* species were not recorded. At Lochinvar and Chanyanya (with Kafue) landings were the same as catch.

COMMERCIAL FISHING METHODS

Gillnets are used by fishermen throughout the year, although in the low water period fish are more often caught in drawnets than in gillnets. Gillnets manufactured in Zambia and used by the majority of Kafue fishermen are 91.4 metres stretched length, 20 mesh depth, and of twine size number 12. During this study the fishermen mounted the nets loosely with a cord passed through the upper line of meshes; floats were of wood or reed rather than cork, and stones were used as sinkers. Most nets of 91.4 m were hung to more than the half, i.e. to 50 or 55 metres. Gillnet mesh sizes were smaller in the upstream and downstream sectors than in the central sector (Table 1).

In the central sector a drawnet used by commercial fishermen consisted of gillnets mounted three deep and two or three wide to make a unit about 90 to 140 metres hung length, and 60 meshes depth. The nets were of 7.6 cm to 10.2 cm stretch mesh and of number of 12 twine size; no bag was present. In the upper and lower sectors additional gillnets were added to give greater length to the drawnet (Table 2).

Fishermen set their drawnets across the river about 500 metres upstream of the landing beach. Two persons on the river bank on the side of the landing beach held a rope connected to one end of the net, and two more men moved in a canoe along the opposite bank of the river whilst holding the second end of the net. The net was pulled downstream at a pace slightly faster than that for the prevailing river flow, and after about fifteen minutes was hauled ashore on the landing beach. Fish might be either gilled or lie free in the net.

Fishermen also used two or three gillnets

Table 1. Mesh size of gillnets used by fishermen on the Kafue floodplain

Area	Percentage of total				
Mesh sizes	671mm	783mm	895mm	1009mm	1121mm
Itezhitezhi to Chikwato	47.5	43.2	9.3	—	—
Below Chikwato to Shakapinga	8.3	27.2	48.2	14.1	2.1
Chifulamino to Kafue Road Bridge	41.4	38.8	19.6	—	—

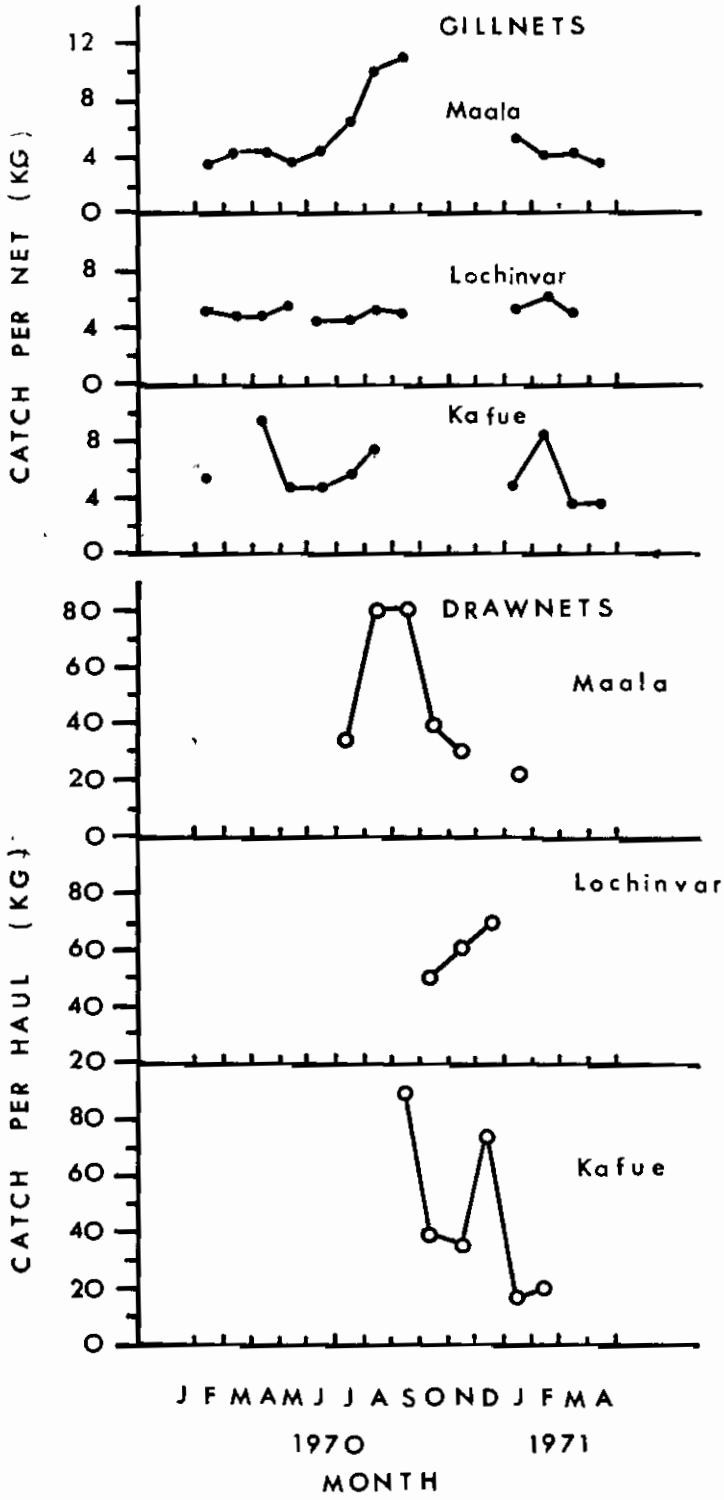

Figure 3. The mean catch per unit effort of gillnets and drawnets.

DAILY NUMBER OF LANDINGS

NETS PER PERSON

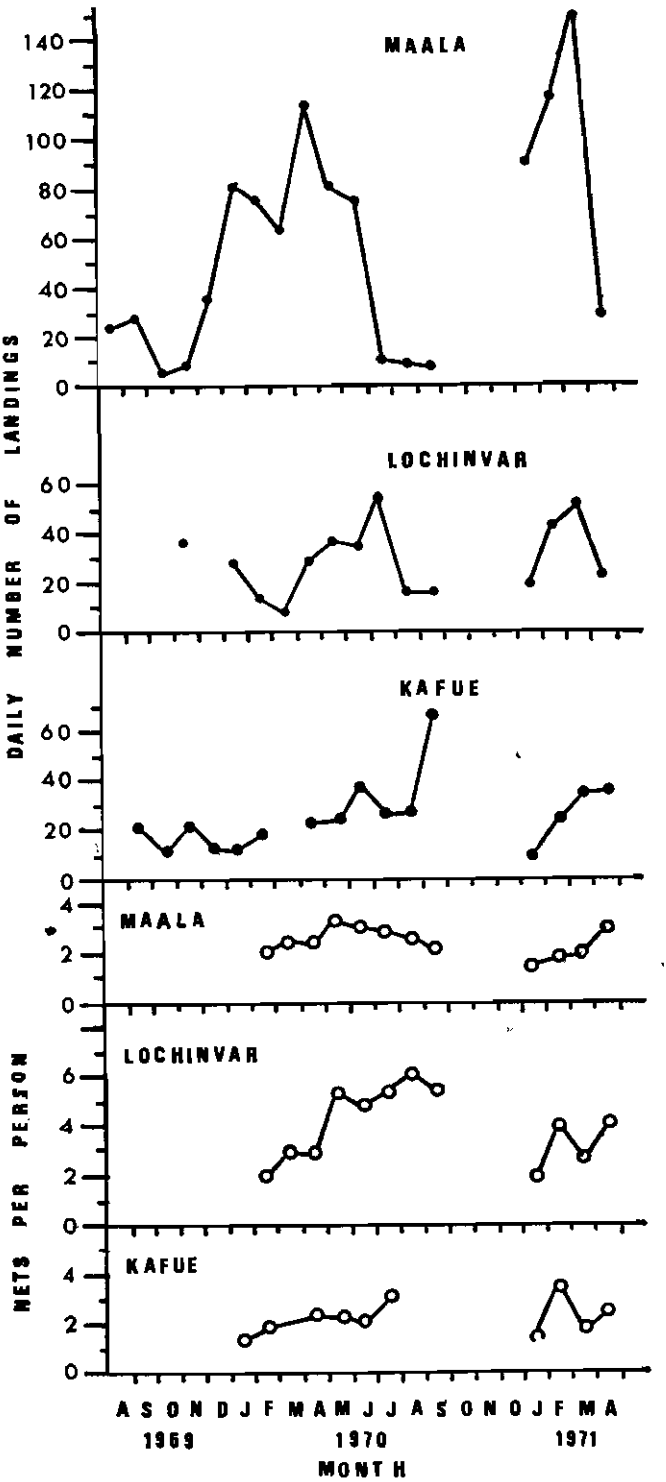

Figure 4. The mean number of landings per day, and the mean number of nets used per landing.

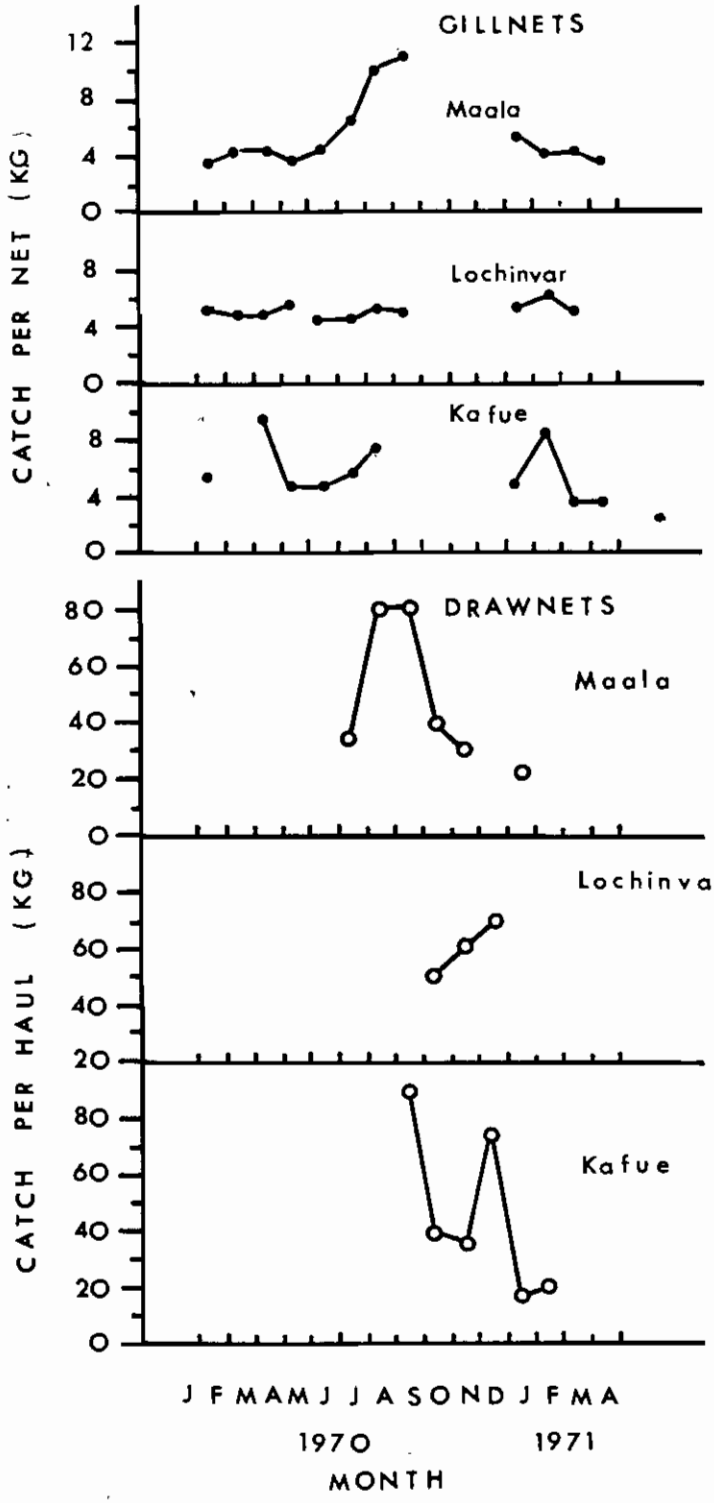

Figure 3. The mean catch per unit effort of gillnets and drawnets.

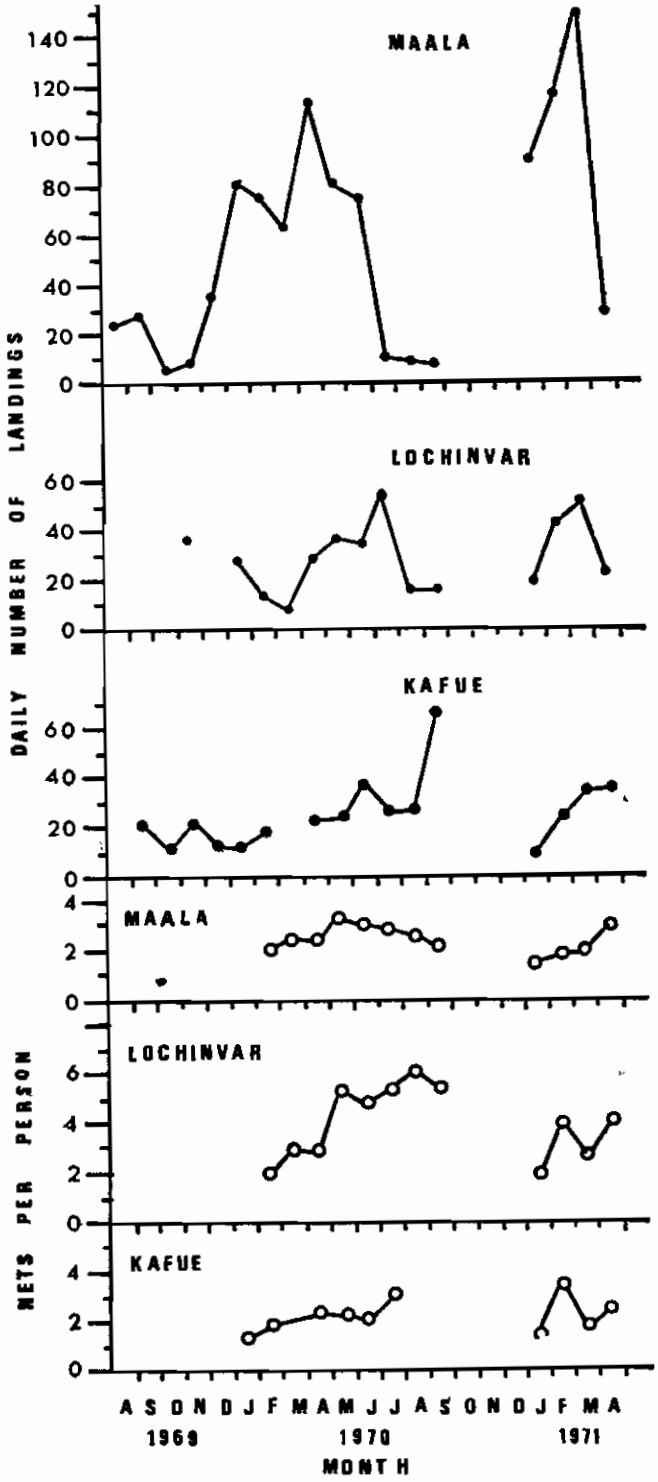

Figure 4. The mean number of landings per day, and the mean number of nets used per landing.

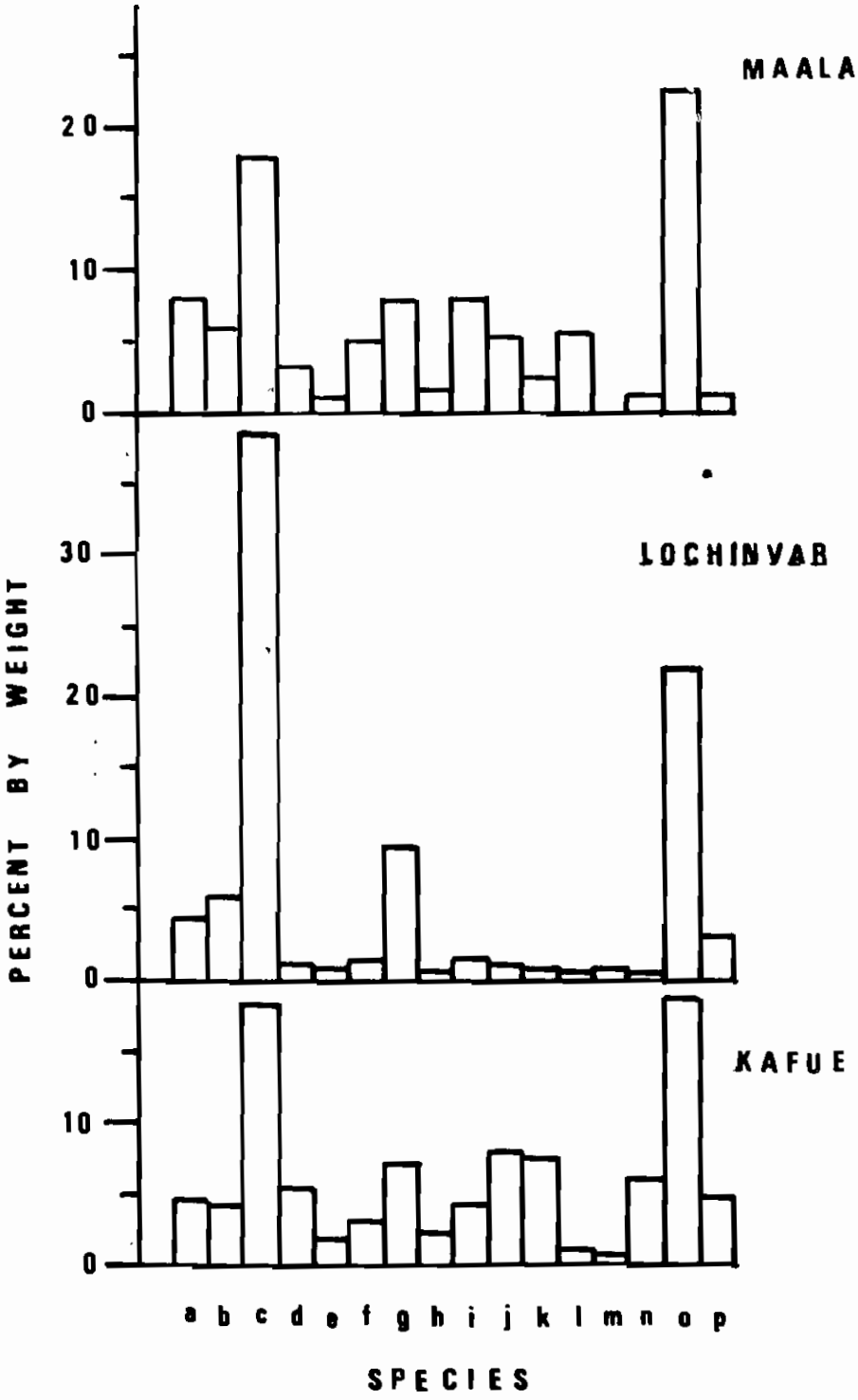

Figure 5. The percentage abundance of species, by weight. Species abundance at Maala is based on the assumption that 25% of the catch was *C. gariepinus*.

a. *Tilapia melanopleura*
b. *T. macrochir*
c. *T. andersoni*
d. *T. sparmani*
e. *Serranochromis robustus*
f. *S. macrocephala*
g. *S. angusticeps*
h. *S. thumbegi*
i. *Haplochromis* spp.
j. *Schilbe mystus*
k. *Hepsetus odoe*
l. *Labeo molybdinus*
m. *Mormyrus lacerda*
n. *Gnathonemus macrolepidotus*
o. *Clarias gariepinus*
p. *C. ngamensis*

drawnet season was 48.1 kg at Maala, 80.3 kg at Lochinvar, and 31.0 kg at Kafue.

Number of landings by fishermen with gillnets was consistently higher at Maala than in the other areas (Fig. 4) due to the large number of fishermen selling to traders. Greatest effort at Maala was in April 1970 and March 1971. Effort was highest at Lochinvar in July and at Chanyanya in June. Fishermen generally used more gillnets per night (about 5 nets) at Lochinvar than at Maala or Chanyanya (about 3 nets). Gillnets used by each fisherman were not counted in certain months, and neither were gillnet landings, due to the low intensity of gillnet fishing and recording efforts being devoted to the drawnet fishery.

The most common of the exploited fish species on the floodplain, both by weight and number, were *Clarias gariepinus* and *Tilapia andersoni* (Fig. 5). The percentage weight of species at Maala is tentative because *Clarias* species were not recorded. A greater percentage of non-cichlids were in the catch at Maala and Kafue than at Lochinvar.

The length frequency distribution of *Tilapia andersoni, Tilapia macrochir, Serranochromis angusticeps,* and *Clarias gariepinus* were followed by 3-monthly intervals (Fig. 6). It is apparent that all fish caught in the Lochinvar area were generally larger than the same species caught in other areas.

A study of the catch by drawnets was made in 1968 (EVERETT 1971), 1969, and 1970 in early December each year, at the same landing beach at Nyimba. Characteristics of the nets used were similar each year. Investigation of the percentage composition of the catch, by number, revealed an almost constant abundance of *Tilapia andersoni* (Table 3). *Clarias gariepinus* and *Schilbe mystus* were caught more frequently in 1969 than in other years. *Serranochromis*

Table 3. Percentage composition of the catch by species, at Nyimba

Species	Year		
	1968	1969	1970
Total number of fish	2,197	2,025	7,979
Tilapia melanopleura	10.92	3.41	7.59
Tilapia macrochir	10.65	22.34	15.93
Tilapia andersoni	54.42	52.40	55.14
Tilapia sparmani	0.32	0.00	0.01
Serranochromis robustus	0.05	0.10	0.25
Serranochromis angusticeps	3.00	2.09	10.57
Serranochromis macrocephala	0.24	0.14	0.35
Serranochromis thumbergi	0.77	1.48	0.41
Haplochromis species	0.82	0.30	2.75
Schilbe mystus	2.23	13.34	0.90
Hepsetus odoe	1.09	0.35	0.09
Labeo malybdinus	1.41	0.20	0.61
Mormyrus lacerda	0.91	0.05	0.12
Barbus marequensis	0.91	0.00	0.00
Synodontis macrostigma	0.41	0.20	0.05
Gnathonemus macrolepidotus	0.27	0.05	0.26
Clarias gariepinus	10.60	2.72	3.25
Clarias ngamensis	2.59	0.10	1.64

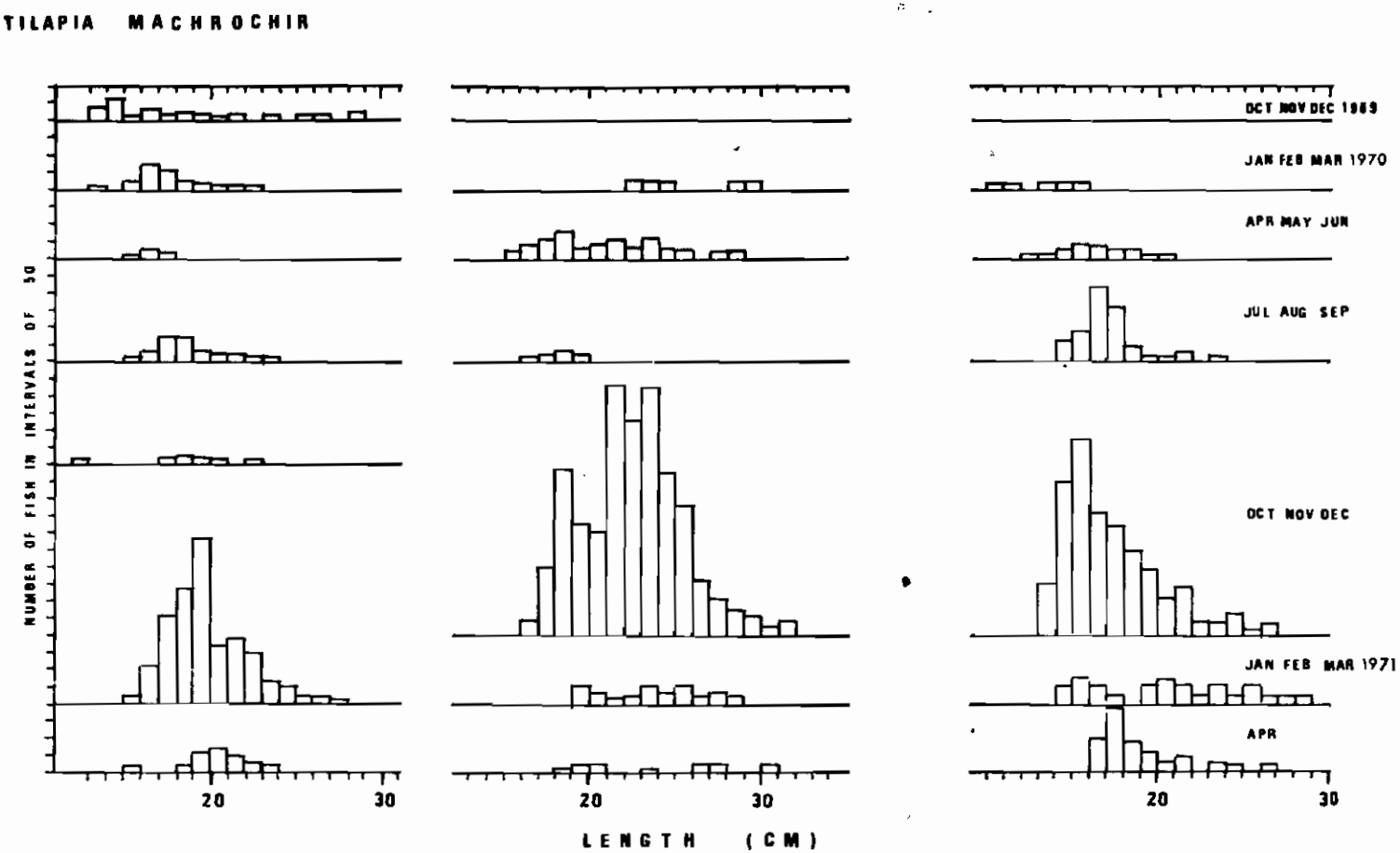

Figure 6(a). Length frequency distribution of *Tilapia andersoni* and *Tilapia macrochir*

CLARIAS GARIEPINUS

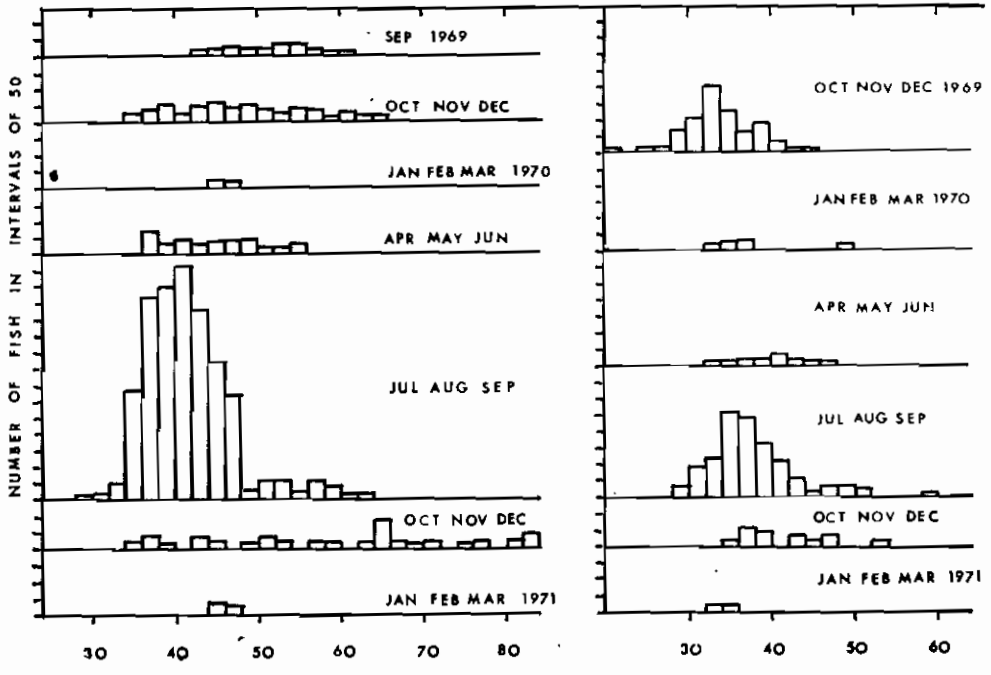

Figure 6(b). Length frequency distribution of *Clarias gariepinus* and *Serranochromis angusticeps.*

Table 4. Weight of fish caught per drawnet haul at Nyimba, Lochinvar

	1968	1969	1970
Number of hauls	48	20	25
Catch (kg) per haul	25.6	33.9	126.4

angusticeps were more frequently caught in 1970 than in 1968 and 1969. The catch per haul was considerably higher in 1970 than in 1969 and 1968 (Table 4).

DISCUSSION

As is to be expected in a floodplain fishery the Kafue fishermen tend to move between fish camps depending on the state of water level, abundance of fish and catching opportunities. Throughout this study the recording could not take place in solely one camp of each sector. The limitation may have introduced inconsistencies in the data. When recording catches at Kavua and Busangu the total catch was probably correct for all Maala area. But at low water level the fishing effort at nearby camps increased and the total catch recorded was not so accurate for the area. Similarly in April a lesser number of fishermen were fishing in the lagoons near Nyimba and did not land fish at Namalio. However, in general it has been deemed justifiable to assume that the results are a reasonable presentation of the actual fluctuations in catch, effort, and species abundance.

Since *Clarias* species were not weighed at Maala the actual daily catch per unit effort was probably higher than recorded. It is suggested that the greater effort exerted by fishermen at Maala in March and April probably reflects a greater demand for fish by line-of-rail traders when the rain ceased. Effort was high at Lochinvar in July and at Chanyanya in June. This corresponds to times of easy access to the camps, and high water level.

Other fish caught on the floodplain were *Alestes lateralis* on rod and line and in weirs in the dry season, and *Gnathonemus macrolepidotus* at the mouth of the Kafue Gorge with dip nets in December 1969.

At Lochinvar the Clarias species caught in 1968 were of a larger size than those caught in the same place in 1969 and 1970. This is probably due to the low water level which made it rather easier for large fish to be caught in drawnets. It is true that large mesh nets were used at Lochinvar by fishermen and that larger fish were caught there than in the other areas; but it is probably justifiable to believe that large mesh gillnets would have been used in the upstream and downstream sectors if the larger fish had been abundant, simply because of the high commercial value of these larger fish.

LAGLER, KAPETSKY and STEWART (1972) have noted that a straight line relationship exists between the yield of the Kafue fishery and that of the area beneath curve of water level at Kafue Rail Bridge in the two years preceding yield. The CENTRAL STATISTICAL OFFICE (1971) gives the official total commercial catch for the Kafue fishery in 1970 as 8,653 tons. However, it is highly likely that the official figure underestimates the actual figure. Catch per unit effort at Nyimba in the three-year drawnet study was also higher in 1970 than in previous years.

WILLIAMS (1960) summarised the principal features of the early development of the Kafue floodplain fishery. Although some confusion may be caused by the standard unit of effort, there are indications that, whereas the catch per gillnet in the years 1965-1970 may be lower than in the 1950s, the drawnet catch per unit of effort of these later years is higher than in the 1950s.

SUMMARY

In this paper is examined, compared, and analysed the monthly catch, effort, size and abundance of fish species, as caught by fishermen in the upstream, central, and downstream sectors of the Kafue floodplain.

Gillnets are used by fishermen throughout the year, although predominantly in the time of high flood level. In the dry season the gillnets are joined to form "drawnets" which can be pulled through the water like a "beachseine".

The annual mean catch per unit effort of gillnet was similar in all areas and ranged from 5.2 to 5.7 kg. The mean catch per haul during the 1970 drawnet season was 48.1 kg in the upstream sector, 80.3 kg in the central sector, and 31.0 kg in the downstream sector. Fishermen used an average five gillnets per night in the central sector and only three per night in the other sectors. *Tilapia andersoni* and *Clarias gariepinus* were the fish caught in greatest weight by the fishermen.

In comparing the catches of this survey with those of earlier years there are indications that although the catch per gillnet in 1965-1970 may be lower than in the 1950s the drawnet catch per unit of effort of these later years is higher than in the 1950s.

ACKNOWLEDGEMENTS: I am grateful to A. B. E. Mabaye, Senior Fisheries Research Officer, J. B. Mubanga, Deputy Director of Fisheries, and numerous personnel of the Department of Wildlife, Fisheries, and National Parks, for assistance in undertaking this study.

REFERENCES

Chapman, D. W., Miller, W. H., Dudley, R. G., and Scully, R. G. 1971. Ecology of fishes in the Kafue River. FI: SF/ZAM 11. Technical Report 2. Central Fisheries Research Institute, Chilanga, Zambia. 66 p.

Central Statistical Office. 1970. Monthly bulletins of statistics. Government Printer, Lusaka.

Everett, G. V. 1971. Sampling fish stocks in the Kafue River. *Fish. Res. Bull. Zambia 5:* 297-394.

Lagler. K. F., Kapetsky, J. M., and Stewart, D. J. 1972. The fisheries of the Kafue River Flats, Zambia, in relation to the Kafue Gorge Dam. FI: SF/ZAM 11. Technical Report 1. Central Fisheries Research Institute, Chilanga, Zambia. 161 p.

Williams, N. V. 1960. A review of the Kafue River Fishery. *Rhodesia Agricultural Journal 57:* 86-92.